What is claimed is:

1. A method for diagnosing an increase in fluid consumption in a fluid power system including a fluid supply line operatively connected to a plurality of valves which are each connected to a corresponding actuator by at least one branch, the at least one branch of each actuator being selectively pressurized and exhausted by the corresponding valves, the method comprising the steps of:

(a) sensing a fluid flow through the supply line and calculating fluid consumption values during a system cycle;

(b) defining a plurality of episodes wherein each episode corresponds to a time period when the at least one branch of one of the plurality of actuators is pressurized;

(c) calculating a change in fluid consumption for each episode to obtain a change in fluid consumption value, ΔFC, for the at least one branch of each of the plurality of actuators;

(d) comparing the ΔFC values to a predetermined reference fluid consumption value for each of the at least one branch of each of the plurality of actuators during a system cycle to obtain a deviation value for the at least one branch of each of the plurality of actuators;

(e) in response to the actuator having a plurality of branches, calculating the difference between the deviation value of each of the plurality of branches of the actuator to obtain an actuator deviation value for each of the plurality of actuators;

(f) in response to the actuator having only one branch, the deviation value for the one branch equals the actuator deviation value;

(g) comparing the actuator deviation values for each actuator to determine which of the plurality of actuators has the highest deviation value;

(h) in response to the actuator having the highest deviation value having only one branch, generating a signal indicating that the one branch has an increase leak in fluid consumption;

(i) in response to the actuator having a plurality of branches comparing the deviation values for the branches of the actuator with the highest deviation value to determine which branch has the highest deviation value; and

(j) generating a signal indicating that the branch with the highest deviation value has an increase leak in fluid consumption.

2. The method as defined in Claim 1, wherein the step of calculating the ΔFC value for each episode is calculated by mathematically differentiating the air consumption over the time duration of the episode.

3. The method as defined in Claim 1, wherein after step (a) and before step (c) further includes the steps of;

calculating a current total air consumption value for a number of predetermined actuator movements or pressurization times;

comparing the current total air consumption value to a reference total air consumption value to obtain a difference value, whereby if the difference value exceeds a predetermined amount, then continue to step (c), if the difference value is less than a predetermined amount then go to step (a).

4. The method as defined in Claim 1, wherein the step of calculating the ΔFC value for each episode is determined by calculating the slope value of a line plotting fluid consumption over time.

5. The method as defined in Claim 4, wherein the slope value corresponding to each episode is calculated by obtaining an air consumption average Y1 over a first predetermined portion of a beginning of an episode and obtaining an air consumption average Y2 over a second predetermined portion of an end of the episode and dividing the difference between Y2 and Y1 by the total time of the episode.

6. The method as defined in Claim 5, wherein the first and second predetermined portions are selectable by a user.

7. The method as defined in Claim 5, wherein the first and second predetermined portions are determined by the monitoring device and are calculated as a percentage of a total length of the episode.

8. The method as defined in Claim 1, further including the step: in response to a condition where all the deviation values for each branch and each actuator exceeds a predetermined value, generating a signal indicating that there is a leak in the supply line.

9. A method of diagnosing leakage in a fluid power system including a fluid supply line operatively connected to a plurality of valves which are connected to a plurality of actuators, the method comprising the steps of:

processing flow signals generated by a flow sensor disposed in the supply line to obtain fluid consumption over time;

processing signals used to change the state of the plurality of valves to determine a plurality of episodes, each of the plurality of episodes corresponding to a pressurization of a particular branch of a particular actuator;

combining the flow signals with the signals used to change the state of the valves to calculate a change in air consumption value, ΔFC, for each valve change of state;

comparing the ΔFC values for each episode to a predetermined reference value to determine a deviation value corresponding to a particular one of the plurality of episodes;

identifying the one of the plurality of episodes with the greatest deviation; and

generating a signal indicating that a leak is present in the system and indicating the corresponding branch responsible for the leak.

10. A method of diagnosing leakage in a fluid power system including a fluid supply line operatively connected to a plurality of valves which are each connected to a corresponding actuator by a first and second fluid supply branch, the first and second branches of each actuator being selectively pressurized and exhausted by the corresponding valves, the method comprising the steps of:

defining a plurality of episodes wherein each episode corresponds to a time period when one of the first and second branches of one of the plurality of actuators is pressurized;

sensing the flow of fluid through the supply line to determine fluid consumption;

calculating a change in fluid consumption value ΔFC, for each episode to obtain a ΔFC value for each branch;

comparing the ΔFC value to a predetermined reference value for each of the branches of each of the plurality of actuators during a system cycle to obtain a deviation value for each of the first and second branches;

calculating the difference between the deviation value of the first and second branches to obtain an actuator deviation value;

comparing the actuator deviation values for each actuator to determine which of the plurality of actuators has the highest deviation value;

comparing the actuator deviation values for the first and second branches for the actuator with the highest actuator deviation value to identify which one of the first and second branches has the highest deviation value; and

generating a signal indicating that the one of the first and second branches with the highest deviation value has a leak.

11. The method as defined in claim 10, further including the step of calculating the predetermined reference values for each of the episodes before calculating a ΔFC value for each episode.

12. The method as defined in Claim 10, wherein the step of calculating the ΔFC value for each episode is determined by calculating the slope value of a line plotting fluid consumption over time.

13. The method as defined in Claim 12, wherein the slope value corresponding to each episode is calculated by obtaining an air consumption average Y1 over a first predetermined portion of a beginning of an episode and obtaining an air consumption average Y2 over a second predetermined portion of an end of the episode and dividing the difference between Y2 and Y1 by the total time of the episode.

14. The method as defined in Claim 13, wherein the first and second predetermined portions are selectable by a user.

15. The method as defined in Claim 13, wherein the first and second predetermined portions are determined by the monitoring device and are calculated as a percentage of a total length of the episode.

16. A method of diagnosing leakage in a fluid power system including a fluid supply line operatively connected to a plurality of valves which are each connected to a corresponding actuator by a first and second branch, the first and second fluid supply branches of each actuator being selectively pressurized and exhausted by the corresponding valves, the method comprising the steps of:

monitoring the plurality of valves to determine which branch of each of the plurality of actuators is pressurized;

defining a plurality of episodes wherein each episode corresponds to a time period when one branch of one of the plurality of actuators is pressurized;

sensing the flow of fluid through the supply line to determine an amount of fluid consumed for each episode to form a flow consumption curve;

calculating an actual slope value for each branch from the flow consumption curve;

comparing the actual slope value to a predetermined reference slope value for each of the branches of each of the actuators during a system cycle and generating a deviation value for each of the branches;

calculating the difference between the deviation value of the first and second branches to obtain an actuator deviation value for each actuator;

comparing the actuator deviation values for each actuator to each other to determine the actuator with the highest actuator deviation value;

comparing the deviation values of the first and second branches of the actuator with the highest deviation value to determine which one of the first and second branches has the highest deviation value; and

generating a signal indicating that the one of the first and second branches with the highest deviation value has a leak.

17. A method of diagnosing leakage in a fluid power system including a fluid supply line operatively connected to a plurality of valves which are each connected to a corresponding actuator by a first and second branch, the first and second branches of each actuator being selectively pressurized and depressurized by the corresponding valves, the method comprising the steps of:

(a) calculating an actual total fluid consumption value for a system cycle;

(b) comparing the actual total fluid consumption value to a predetermined reference total fluid consumption value, when the actual total fluid consumption value deviates a predetermined amount from the reference value then proceed to step (c), if the actual total fluid consumption value is deviated less than the predetermined amount from the reference value then return to step (a);

c) defining a plurality of episodes wherein each episode corresponds to a time period when one branch of one of the plurality of actuators is pressurized;

d) sensing the flow of fluid through the supply line to obtain fluid consumption values;

e) calculating a fluid consumption value for each episode to obtain a fluid consumption value for each branch;

f) comparing the fluid consumption value to a predetermined reference value for each of the branches of each of the plurality of actuators during a system cycle to obtain a deviation value for the first and second branch;

g) calculating the difference between the deviation value of the first and second branches to obtain an actuator deviation value;

h) comparing the actuator deviation values for each actuator to determine which of the plurality of actuators has the highest deviation value;

i) comparing the deviation values for first and second branches for the actuator with the highest actuator deviation value to identify which branch has the highest fluid consumption value; and

j) generating a signal indicating that the identified branch with the highest fluid consumption value has a leak.

18. An apparatus for diagnosing leakage in a fluid power system including a fluid supply line operatively connected to a plurality of valves which are each connected to

a corresponding actuator by a first and second branch, the first and second branches of each actuator being selectively pressurized and depressurized by the corresponding valves, the apparatus comprising:

a flow sensor disposed in the fluid supply line for sensing fluid flow to the plurality of valves;

a monitoring device operatively connected to the flow sensor, the monitoring device including a processor and memory;

a valve controller operatively connected to each of the plurality of valves and operatively connected to the monitoring device, the valve controller generating signals to cause the plurality of valves to shift state;

the monitoring device defining a plurality of episodes wherein each episode corresponds to a time period when one branch of one of the plurality of actuators is pressurized;

the monitoring device calculating a change in fluid consumption values, ΔFC, from signals received from the flow sensor;

the monitoring device calculates a ΔFC value for each episode to obtain a ΔFC value for each branch and compares the ΔFC value to a predetermined reference value for each of the branches of each of the plurality of actuators during a system cycle to obtain a deviation value for the first and second branch;

for each actuator, the monitoring device calculates the difference between the deviation value of the first and second branches to obtain an actuator deviation value, and compares the actuator deviation values for each actuator to determine which of the plurality of actuators has the highest deviation value;

for the actuator with the highest deviation value, the monitoring device compares the fluid consumption values for first and second branches to determine which branch has the highest fluid consumption value, and generates a signal indicating that the branch with the highest fluid consumption value has a leak.

19. The apparatus as defined in Claim 18, wherein the monitoring device included a microprocessor.

20. The apparatus as defined in Claim 19 wherein the microprocessor included memory for storing calculated values and an input device for receiving signals from the flow sensor and signals from the valve controller.

21. The apparatus as defined in Claim 18, wherein the functions of the monitoring device and the functions of the valve controller are performed by a single processing unit.